Representations and Finite Fields

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Conference in honour of Professor Rod Gow on the occasion of his 65th birthday

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Tuesday, May 28, 2013

School of Mathematical Sciences, University College Dublin

Location: Room 326, Engineering Building

Schedule

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09:00 - 09:10	**Welcome**	
09:10 - 10:10	**Ryan Vinroot**	*Real-valued characters of finite groups of Lie type*
10:10 - 11:10	**Wolfgang Willems**	*Metabolic symplectic G-spaces*
11:10 - 11:40	**Coffee Break**	
11:40 - 12:40	**Alexandre Zalesski**	*On the Steinberg characters of orthogonal groups*
12:40 - 14:30	**Lunch**	
14:30 - 15:00	**Rachel Quinlan**	*Partial matrices of constant rank over small finite fields*
15:00 - 15:30	**John Murray**	*Symplectic geometry and induction*
15:30 - 15:50	**Coffee Break**	
15:50 - 16:20	**Gary McGuire**	*My favourite theorem of Rod Gow*
16:20 - 16:50	**Rod Gow**	*Reflections on forty years of trying to understand mathematics*
17:00 - 18:00	**Reception**	*Common Room, first floor, block A, Newman Building*
19:30	**Conference Dinner**	*Mulberry Garden, Donnybrook*

Locations

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- Clicking on the following link will transport you to a map of the UCD campus:

  `http://www.ucd.ie/maps/2012/UCD_Map_July_2012_UCD_Map.pdf`

  The relevant section of the map is:

- The talks will be in Room 326, Engineering Building, top floor. This is building 22 on the campus map.
- The reception will take place in the UCD *Common Room Club*, first floor, block A of the Newman building, which is building 41 on the campus map.
- The conference dinner will take place in the *Mulberry Garden* restaurant, Mulberry Lane, Donnybrook:

  `http://mulberrygarden.ie/`

  The restaurant can be reached by busses 39A, 46A, 145 which can all be boarded at the UCD Main entrance (approx. 31 on campus map). The fare is EUR 2.15 (exact fare only).

  Ask the driver to stop at "Kiely's pub in Donnybrook", cross the road (carefully; there are traffic lights nearby). Mulberry lane is the narrow lane in front of Kiely's pub. The bus journey from UCD to Donnybrook takes between 5 and 10 minutes.

  On foot, it is a 30 minutes brisk walk from the UCD main entrance to the restaurant.

  For people who are driving, there is ample parking nearby the restaurant.

Abstracts

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Ryan Vinroot
(College of William and Mary)
Real-valued characters of finite groups of Lie type

I will give a survey of results on real-valued characters of finite reductive groups, a topic on which Rod Gow proved many pioneering results. I will then describe some recent results with Bhama Srinivasan, where we are able to precisely parameterize the real-valued characters of any finite reductive group with connected center, by using the Jordan decomposition, or Lusztig parameters, of the characters.

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Wolfgang Willems
(Otto-von-Guericke-Universität Magdeburg)
Metabolic symplectic G-spaces

It is well known that there is only one isometry class of nondegenerate symplectic K-vector spaces V of a fixed even dimension, namely the orthogonal sum of hyperbolic planes. This is no longer true if groups are involved and the characteristic of K is 2. For so-called metabolic spaces $M(V)$ where V is a KG-module we determine the full set of isometry classes. It turns out that for an indecomposable module V the classes form a vector space which can be described easily. If we specialize to projective indecomposable modules this vector space coincides canonically with a cohomology module. Moreover, its dimension is a known invariant in representation theory.

Alexandre Zalesski
(Università degli Studi di Milano-Bicocca)
On the Steinberg characters of orthogonal groups

I shall discuss the decomposition of the Steinberg character of the orthogonal group $SO(2n, q)$ restricted to the subgroup $SO(2n-1, q)$. The main result is that the restriction is a multiplicity free character.

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Rachel Quinlan
(NUI Galway)
Partial matrices of constant rank over small finite fields

In a partial matrix over a field $\mathbb{F}$, entries are either specified elements of $\mathbb{F}$ or indeterminates. Indeterminates in different positions are independent, and a *completion* of the partial matrix may be obtained by assigning a value from $\mathbb{F}$ to each indeterminate. A number of recent research articles have investigated partial matrices whose completions all have the same rank or satisfy specified rank bounds.

This talk is concerned with the following question: if all completions of a partial $m \times n$ matrix A over a field $\mathbb{F}$ have the same rank r, must A possess an $r \times r$ sub(partial)matrix whose completions are all non-singular? This question has an affirmative answer if and only if the field $\mathbb{F}$ has at least r elements. The talk will concentrate mostly on the case where this condition is not satisfied.

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John Murray
(NUI Maynooth)
Symplectic geometry and induction

We attempt to generalise the notion of an extended defect group of a 2-block to an extended vertex of a module with a symplectic geometry. Along the way, we encounter some favourite ideas of Rod Gow: bilinear forms, involutions, pairing arguments and other techniques exclusive to the 2-modular representation theory of finite groups.

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Gary McGuire
(UCD)
My favourite theorem of Rod Gow

I will discuss a simple and beautiful theorem concerning polynomials over finite fields, which was generalized to cyclic extensions by Gow and Quinlan (Linear Algebra and its Applications, 2009). If time permits I will also discuss remarkable theorems of Gow (Journal of Number Theory 1986, 1989) concerning Galois groups.

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